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LEUCOBRYUM GLAUCUM SCHP.

By W. H. Burrell, F.L.S.

Leucobryum glaucum Schp., in unattached double convex discs, has recently been detected in Norfolk, England, enabling me to take an active interest in the two previous records, published in Dixon's "Handbook of British Mosses," and in The Bryologist, Vol. IX, No. 4, July, 1906. The former describes spheroidal balls or cushions from Hedsor, Bucks, entirely unattached, consisting of stems radiating outwards from a central point. The latter refers to an apparently similiar cushion found by B. D. Gilbert in hemlock woods in Otsego Co., New York, which was observed to be resting in a matrix, of its own diameter, and about half an inch deep. Mr. Gilbert offers no explanation as to how the cushion separated itself and developed its radiate growth, neither does he state what the underlying cup was composed of; if it consisted of the older portions of Leucobryum stems, from which the cushion had separated, there is no analogy between the Otsego and Norfolk examples; if, however, the cup was composed of earthy matter, similar causes may have originated the cushions, heavy rain or flood causing it in this instance to become embedded.

A careful study of the large quantity of material at hand leads me to expect this form of Leucobryum to be wide spread and frequent; it is with the object of stimulating observation that this note is prepared.

In the parish of Aylmerton, Norfolk, on the slope of a hill, under the shade of beech trees, several hundreds of small cushions of Leucobryum are growing, a series of intermediates showing the connection between normal plano-convex tufts firmly attached to the forest soil and double convex unattached discs exhibiting no distinction between base and summit. Some are resting on fallen leaves of the previous autumn to which they are attached by radicals and mycelium; others are resting on their convex surface with the plane earth-covered base directed skyward through inversion: one fine tuft four inches (10 cm.) in diameter, with a clean base devoid of earthy matter was resting on a bed of *Mnium hornum* L ; it had been there long enough for the base to conform to the inequalities of the underlying moss and the latter was slightly discolored; others had in varying degrees pushed out new growth, illustrating stage by stage the gradual formation of the double convex cushion. Perfect cushions are the exception, rather than the rule, though many occur.

The rigid habit of the plant, its method of vegetative reproduction and the structure of the leaves are important factors in the development of the

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Explanation Plate XII. *Leucobryum glaucum* Schimp.

Fig. 1. Portion of leaf with bud developing from rhizoids × 15 diam.

Fig. 2. Transverse section of portion of leaf showing a single layer of chlorophyllose cells (a) embedded in 2-4 layers of hyaline cells with bordered pores (b) × 170 diam.

Figs. 3, 5, 7. Cushions, lower surface, reduced to one-half diam.

Figs. 4, 6. Cushions, upper surface, reduced to one-half diam.

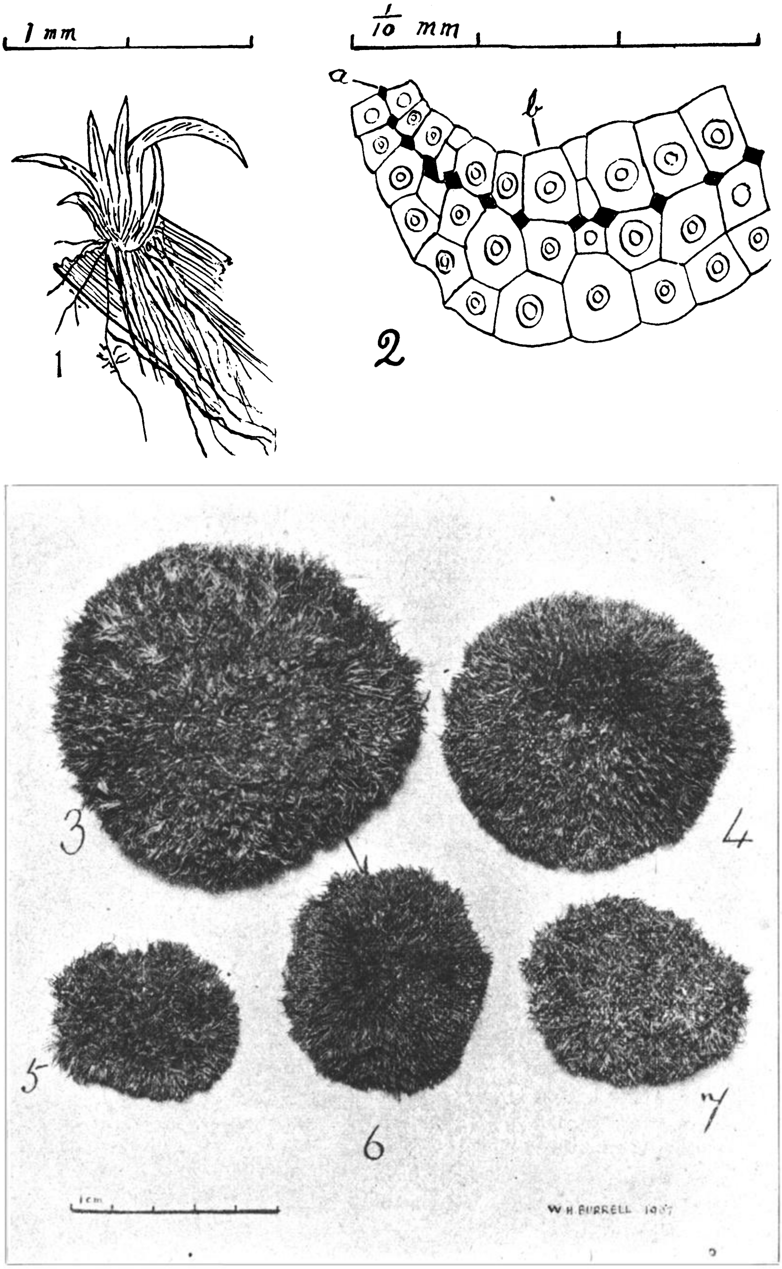

PLATE XII – *Leucobryum glaucum* Schimp.

form under discussion. The leaves of most mosses are built up of a single layer of cells which quickly part with their moisture in dry air and as readily re-absorb it from damp air. The leaves of Leucobryum, however, have a remarkable cell structure allied to that of Sphagnum, consisting of a single layer of chlorophyllose cells (Fig. 2a) embedded in 2-8 layers of empty hyaline cells whose adjoining walls are perforated with bordered pores (Fig. 2b). When the hyaline cells are filled with water the green color of the embedded chlorophyllose cells is seen: when water is displaced by air the plant assumes a dirty white color suggestive of the name leucobryum—white moss. The water held by these cells after rainfall can be squeezed out as from a sponge and renders unattached tufts self-sustaining on the same principle that camels can exist for considerable periods in arid deserts—they carry their own supply. In Braithwaite's British Moss Flora reference is made to the abnormal vitality of the genus, and persistent growth even in the drying press: dipping in boiling water before pressing is recommended to prevent dehiscence of the capsule.

Leucobryum is not a frequent fruiter: in compensation for the rarity of spore formation new growth proceeds from buds developed from radicals which are freely formed on the surface of the leaves. (Fig. 1). Regardless of the position of the parent tuft these buds develop geotropically at whichever surface happens to be uppermost at the time. The double convex form assumed by the most perfect tufts, and to which all conform more or less, is favored by the rigid habit of the plant and by its squat growth in the locality referred to. In its most luxuriant form Leucobryum is a denizen of swamps where it forms large bosses 6-8 inches high, but at Aylmerton the average height is 1½ inches (3-4 cm.). A tuft torn from a deep boss, would lie prostate: but the short tuft when disturbed has a tendency to come to rest either in its normal position or completely inverted, alternating growth taking place in two definite directions: too much stress must not be laid on this because many examples occur of single stems lying prostrate and producing plano-convex cushions half an inch (12 mm.) in diameter, by the development of buds from the apical leaves. Displaced plants do not to any great extent appear to recover an erect position by curvature of the stem; they remain in the position accident assigns them and form a frame work to which the new growth from buds conforms.

Assuming that I am correct in attributing the unattached state to accidental and repeated disturbance, which brings into play the natural vitality of the plant, and stimulates bud formation, it is not difficult to suggest a cause for the disturbance. The tread of woodmen and sportsmen and the removal of timber play their part, but in well stocked game preserves I have long been familiar with displaced moss, especially *Dicranum scoparium* Hedw., and I have attributed this to the scrapping of pheasants. In open moorland, where Dicranium forms dense masses, the ground is often littered with small tufts which apparently depend upon chance conveyance to a congenial spot for continued existence. In woodland, similar displacement takes place with a slightly different result; in the cool shade Dicranum forms lank lax tufts; when disturbed the stems lie prostrate but growth is hardly arrested: by an exaggeration of the geniculate curve which is a feature of several species, the apiees recover a vertical position and re-establish themselves: in this case balls are not formed but vitality is preserved by a curvature of the stem.

In large game birds may be found, I believe, an ever present and ever active agency for the periodical disturbance necessary.

The activity of these birds may be gauged by an examination of a chestnut grove in winter, when not a nut will be found; hundreds of torn and empty husks will show that birds have fed there. The Leucobryum site at Aylmerton is under beech trees, and the fallen nuts give a direct reason for special attention from birds.

It will not be out of place to refer to another roving moss mentioned by H. N. Dixon, in a paper on the moss flora of Northamptonshire, published in Journ. of Northamptonshire Nat. Hist. Soc. Vol. X. 1899. The author says: "A remarkable form of *Porotrichum alopecurum* Mitt. occurs in " Weldon Quarries, which I have not found, or seen noticed, elsewhere. On "a recent visit in the spring of 1898, the bottoms of some low depressions " under trees were carpeted with globular mosses, which were found to consist of living 'balls' of this moss, entirely detached from the soil and without rootlets, and from two to four or five inches in diameter. The interior "of the 'balls' consisted of the rigid, wiry stems proper to the species, which "had branched profusely in all directions, and so produced this peculiar " form. The branches were extremely dense and numerous, many hundreds " of secondary stems going to make up a single tuft or 'ball,' and entirely " hiding the central stem or stems. From this, as well as from the size of "the tufts, it was clear that they must represent the growth of many months, " probably of several years, and this without connection of any kind with the "soil or other matrix; so that the nutriment must have been obtained "entirely from atmospheric moisture; they were, however, perfectly fresh "and vigorous. No doubt detached stems of this moss, the ordinary form of "which was growing in close proximity, has been carried at various times by " the wind into the hollows, where the moisture of the air, together with the "natural vitality, apparently a marked character of the species, combined " not only to resist decay, but even to promote growth, resulting in the very " unusual phenomenon described."

In a later note Mr. Dixon records a similar growth of *Porotrichum alopecurum* in Ireland, reported by the Curator of the Fernery, Botanic Park, Belfast, who called it "the rolling moss," and described how it grew without roots and was blown about from place to place by the wind: he kept it as a curiosity among his ferns.

The unattached state of Leucobryum and Porotrichum bears no relation to the Wind Witches described by Kerner in Nat. Hist. of Plants, Vol. II, page 850. According to the author a number of herbaceous plants, inhabiting the Steppes of southern Russia, contract into flattened balls at maturity, and, becoming detached from the soil, are rolled along by gusts of wind. The object achieved here is the distribution of seeds: the withered plants lie in sheltered nooks to which they have been blown until the rainy season, when, under the influence of moisture, the seed vessels open and the seeds are washed out. The plants themselves are dead, but in the case of the mosses vitality is maintained for a succession of years.

Sheringham, Norfolk, England.

NOTES ON SPORE DISPERAL IN SPHAGNUM.

E. J. Winslow.

On August 9th of the present year, while botanizing in a swamp near Lake Willoughby, Westmore, Vt., my attention was attracted by the frequent recurrence of a snapping sound like the breaking of a wheat straw. Upon investigation I found that the Sphagnum, which grew abundantly all around, was heavily fruited, and the strongly inflated capsules as they dried out in the mid-forenoon sun, were expelling their spores with the little explosion that I had noticed. I was never able to catch a capsule in the act, but by following the sound quickly I could catch a glimpse of a tiny and very transient cloud of reddish brown spores two or three inches from the top of a bunch of capsules.

I tried unsuccessfully to procure the effect by squeezing the capsules between the thumb and finger, but from a bunch which I gathered and carried in my hand the popping continued until most of the ripe capsules were exploded. As far as I could see there was no breeze or other disturbance to aid in producing the explosion, but the plants were exposed to the direct rays of the sun, and it was the time of day (about 10 a. m.) when the last of the dew was disappearing from the ground. So it would seem that perfect dryness is the only condition necessary to produce the discharge in a ripe capsule.

Elmira, New York.

SULLIVANT MOSS CHAPTER NOTES.

New Members: No. 188—Clarence A. Cheever, M.D., 1531 Blue Hill Ave., Mattapan, Mass. No. 186—Mr. George M. Pendleton, Sisson, California. No. 190—Mrs. Clara Anderson Groves, Thorsby Institute, Thorsby, Alabama.

NOTICE—ELECTION OF OFFICERS FOR 1908.

Members of the Sullivant Moss Chapter are requested to forward ballots AT ONCE to the Judge of Election, Miss Lydia Pritchett Borden, Manoa, Delaware Co., Pa. Polls close November 30th. The following candidates have signified their willingness to serve, if elected. Members, however, are at liberty to vote for any other candidate, should they prefer to do so.